MSFC-525

In NASA's Vision for Space Exploration (Bush, 2004), (Griffin, 2007), humans will once again travel beyond the confines of earth's gravity, this time to remain there for extended periods. These forays will place unprecedented demands on launch systems. They must not only blast out of earth's gravity well as during the Apollo moon missions, but also liftoff the supplies needed to sustain a larger crew over much longer periods. Thus all spacecraft systems, including those for the separation of metabolic carbon dioxide and water from a crewed vehicle, must be minimized with respect to mass, power, and volume. Emphasis is also placed on system robustness both to minimize replacement parts and ensure crew safety when a quick return to earth is not possible.

For short-term phases of manned space exploration, such as transit from the earth to the moon, venting of metabolic carbon dioxide and water to space is more efficient than the inclusion of large recycling systems on the spacecraft. The baseline system for the Orion spacecraft is an amine-based vacuum swing system (Smith, Perry et al., 2006). As part of the development of an alternative approach, a sorbent-based CO_2 and H_2O removal system (Knox, Adams et al., 2006), subscale testing was conducted to evaluate potential performance improvements obtainable by recuperating the heat of adsorption to aid in vacuum desorption. This bed design is shown in Figure 1, is depicted here with a lattice structure instead of reticulated foam for heat transfer. The slot widths are approximately 1.2 mm wide and 8.5 mm long. Bed depth is approximately 4.7 mm. Headers (not shown) were produced by the stereo lithography apparatus at MSFC.

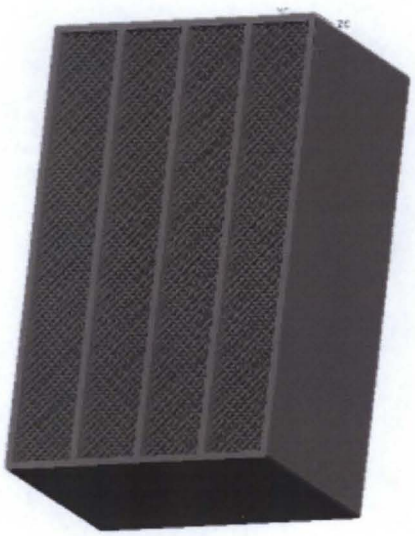

Figure 1. Sub-scale slotted bed with lattice internals

Bush, G. W., "*A Renewed Spirit of Discovery the President's Vision for US Space Exploration,*" pp. Pages, White House, 2004.

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Knox, J. C., J. Adams, K. Kittredge, and P. Fulda, "Development and Testing of a Sorbent-Based Atmosphere Revitalization System for the Crew Exploration

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